

Serial No. 09/900,068 (filed 07/06/01)
Attorney Docket No. GJH-0102
Response to Final Office Action dated 03/17/05

REMARKS

Claims 1 and 12 have been amended by substituting the language "consisting essentially" for "comprised". Applicants made this amendment so that no non-noble metals are used in for the catalyst compositions in the catalytic zones.

Applicants have amended claim 1 to place it in better form. Support for the amendment can be found in claim 12, for example.

CLAIM REJECTIONS

FIRST REJECTION UNDER 35 U.S.C. 103

Claims 1-9 and 11-19, and 21 have been rejected under 35 U.S.C. 103(a) as being obvious in light of German Patent Application DE 1470680, Hallman ("Hallman") in view of United States Patent Number 5,198,099, Trachte, et al. ("Trachte") and United States Patent Number 3,425,810, Scott ("Scott").

EXAMINER'S POSITION

The Examiner takes the position that Hallman discloses a process for removing sulfur from a distillate boiling range feed by contacting the feed in a first reaction stage with a catalyst that contains Co and Mo and then passing the product from the first reaction stage to a second reaction stage where it contacts a catalyst that comprises Ni and Mo. The amount of Mo present in the catalyst ranges from 4 to 30 wt.% and the amount of Group VIII metals in the catalyst ranges from 1 to 6 wt.%. The Examiner continues that inlet temperatures used in the two stages range from 204°C to 399°C and pressures range from 500 to 3000 psi.

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The Examiner notes that Hallman does not disclose reacting the product from the second reaction zone in an additional reaction stage, does not disclose the sulfur and nitrogen present in the effluent from the first reaction stage, that the hydrogen flow is countercurrent, does not explicitly disclose the use of No, Mo, and W in the second reaction stage, and does not disclose the use of a vapor passageway.

Thus, the Examiner has cited Trachte. The Examiner states that Trachte discloses the hydrocracking of a petroleum distillate that has been previously hydrotreated in a two-stage hydrotreating process.

The Examiner continues that in light of the teachings of Scott, the use of a vapor passageway would also have been obvious.

Thus, the Examiner states that it would have been obvious to one having ordinary skill in the art at the time of the present invention to have modified the teaching of Hallman by including a cracking step following the second hydrotreating zone as suggested by Trachte. The Examiner likewise states that it would have been obvious to modify Hallman by using a vapor passageway in that process such as those taught in Scott. The Examiner also states that it would have been obvious to have modified Hallman to include W in the catalyst in the second reaction zone because this metal is disclosed by Hallman as being suitable for use in the catalyst used therein. Thus, the Examiner states that since both W and Mo are disclosed as being individually suitable, the combination of these metals would also be expected to be suitable for use in the catalyst of Hallman.

APPLICANT'S POSITION

It is still applicants' position that one having ordinary skill in the art and knowledge of Hallman, Scott, and Trachte at the time the invention was made would not have found it obvious to arrive at the presently claimed invention.

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Hallman teaches a process wherein an aromatic hydrocarbon distillate boiling above the gasoline range is mixed with hydrogen in a first reaction zone with a hydraulic refining catalyst. At least a part of the developing outflow from the first reaction zone is introduced into a second reaction zone with a hydraulic refining catalyst. The inlet temperature of the second reaction zone is such that the reaction heat within the first reaction zone will lead to an exit temperature of the second reaction zone of less than 427°C. Hallman also states that the first reaction zone contains about 5.0 to about 35.0 vol.% of the total catalyst quantity arranged in the first and second reaction zones.

Trachte teaches a two-stage hydrodesulfurization process wherein the effluent from the second hydrotreating stage is cracked. The first hydrotreating catalyst used in the Trachte process is conventional, and the second hydrotreating catalyst is a noble metal containing zeolite. *The claims as now amended exclude the use of a noble metal in the second stage.* The catalyst contained in both the second and third reaction stages of Trachte are both conventional hydrocracking catalysts, which are typically "comprised of a Group VIII metal hydrogenating component on a zeolite cracking base". See Trachte, col. 4, line 37-43.

The instantly claimed invention is a multi-stage process for removing sulfur and nitrogen components from distillate boiling range petroleum feedstreams. The process comprises reacting the feedstream in a first hydrotreating reaction stage with a CoMo, supported hydrotreating catalyst until the sulfur level of the reacted feedstream is less than about 1500 wppm. The product from the first reaction stage is then reacted in a second hydrotreating reaction stage with counterflowing hydrogen-containing treat gas in the presence of a bed of catalyst comprised of Ni and one or both of a metal selected from Mo and W. The liquid product from the second hydrotreating reaction stage is reacted in at least one additional reaction stage wherein the at least one additional reaction stage is selected from the group

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consisting of an aromatics hydrogenation stage and a hydrocracking reaction stage.

Neither Hallman nor Trachte discloses the use of a staged hydrodesulfurization process wherein the feedstream is reacted over a CoMo catalyst until the reacted feedstream reaches a sulfur level below about 1500 wppm, and then reacting the feedstream in a second hydrodesulfurization stage over a Ni catalyst containing one or both of Mo and W. The Examiner notes in the Office Action that there is no explicit disclosure in Hallman to use a Ni in the catalyst. Trachte also fails to disclose the use of a Ni catalyst in a second hydrodesulfurization stage, and instead discloses and teaches that the second "hydrotreating" catalyst used therein must comprise a Group VIII metal noble metal containing zeolite supported conventional hydrocracking catalyst. See Trachte, col. 4, line 37-43.

Also, neither Hallman nor Trachte realize the benefit of staging a hydrotreating process by passing the feedstream over a CoMo catalyst until the reacted feedstream has a sulfur level of less than 1500 wppm and then reacting the reacted feedstream in a second reaction stage over a second stage catalyst of catalyst comprised of Ni and one or both of a metal selected from Mo and W. As noted in the Examples of the instant specification, most notably Example 1 compared to Comparative Example C and Examples 2 and 3 compared to Comparative Example F, passing the feedstream over the catalyst as presently claimed provides superior results then when the reaction stages are reversed, i.e. the CoMo of the first reaction stage is placed in the second reaction stage. Neither Trachte nor Hallman recognizes the unexpected results achieved by reacting the feedstream in a process having the specific catalyst arrangement presently claimed.

Applicants further take the position that the combination of Hallman and Trachte does not obviate the presently claimed invention. As stated above, the

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Trachte reference includes a hydrocracking stage following two hydrotreating stages. However, the second of these hydrotreating reaction stages uses a conventional hydrocracking catalyst as the second "hydrotreating" catalyst. Thus, one would not be motivated to combine the teachings of Hallman and Trachte. One would not have been taught to utilize the hydrocracking stage of Trachte with the Hallman process because there is no disclosure in Hallman to include such a stage. Further, Trachte teaches that the second "hydrotreating" catalyst must be comprise a Group VIII metal noble metal containing zeolite supported catalyst. This is the only catalyst disclosed as a suitable catalyst in the second reaction stage of Trachte. One having ordinary skill in the art and knowledge of Trachte and Hallman would not have found it obvious to utilizes the cracking stage of Trachte after the second hydrotreating stage of Hallman, which employs a conventional hydrotreating catalyst, because there is no teaching in either patents that this process sequence is desired or beneficial.

Thus, it is applicants' position that one having ordinary skill in the art and knowledge of Hallman, Scott, and Trachte, alone or in combination, would not have found the present invention obvious. One would not have been taught to include an additional reaction stage selected from the group consisting of an aromatics hydrogenation stage and a hydrocracking reaction stage in the Hallman process. Further, one having ordinary skill in the art would lack the requisite teaching of processing the feedstream over a CoMo catalyst until the sulfur level of the reacted feedstream was below about 1500 wppm and then processing the feedstream over a second catalyst comprised of Ni and one or both of a metal selected from Mo and W. Neither Trachte nor Hallman recognizes the unexpected results achieved by operating a process in this arrangement.

The Examiner is requested to reconsider and withdraw this rejection.

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Based on the preceding arguments and amendments, the Examiner is requested to reconsider and withdraw all rejections and pass this application to allowance. The Examiner is encouraged to contact applicants' attorney should the Examiner wish to discuss this application further.

Respectfully submitted:

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